they may be. This single reading of the total amount of *creep* being divided by the number of times the experiment was repeated, and by the given number of degrees of heat through which it had been each time successively raised, and by the original length of the bar, will give the desired coefficient of expansion.

I think that results obtained by this mode of translation will, for minute expansions, be more reliable than those obtained either by Lavoisier and Laplace's method, or by that of Roy and Ramsden. THOMAS STEVENSON

Baden-Baden, August 26

Origin of Insects

IN NATURE of December 7, 1871, there is an interesting letter from Mr. B. T. Lowne, on the Origin of Insects, in which the writer refers to Fritz Müller's "Facts for Darwin" in favour of the opinion that "the larval forms of insects are probably derived from imaginal" or perfect forms. I have not at present any opinion to offer on this subject; but, though I estimate very highly indeed the light which Fritz Müller has thrown on the Crustacea, I think nothing can be more unsatisfactory than his remarks on insects. He concludes that the earliest insects resembled the wingless Blattidæ, overlooking, what is obvious enough, that any theory of the origin of insects ought to account for, or at least show the origin of, those most characteristic organs of the class, the wings. I quite agree with Mr. Lowne that "it is extremely probable that insects first emerged from the water with fully-formed wings." I think it scarcely possible to doubt that the wings were originally organs of aquatic respiration. But this does not answer the question of the origin of insect metamorphoses, which, though an evolutionist, I think one of the greatest difficulties of the theory of evolution; it does not answer the question whether the perfect forms with wings and legs have been derived from the larval forms without either, or the converse.

Mr. Lowne goes on to say, "We have still relics of an aquatic winged insect fauna in the hymenopterous genus, discovered by Sir John Lubbock." I cannot think this brings us any nearer to the origin of insects. It could not do so unless the Hymenoptera were at or near the origin of the class, and this will scarcely be maintained. The Hymenoptera are probably the highest of all insects—certainly so if instinct is the criterion. The aquatic Hymenopteron (I do not know its name) is no more a relic of the origin of insects than are the water-beetles; and no one will say that the Coleoptera are near the origin of the class. It is true that the water-beetles are wingless, while the Hymenopteron in question is winged; but the beetles are a winged order, and those which have no wings have lost them. Indeed, it is only in a functional sense that any beetle is wingless, for they all retain the wing-covers, which are modified wings. It is probably true that the origin of all animals whatever was aquatic, but it does not follow that the aquatic members of any class denote the origin of the class. The aquatic habits and structure may be only adaptive. No one would look to the seal or the hippopotamus for the origin of the Mammalia.

JOSEPH JOHN MURPHY

THE LAW WHICH REGULATES THE FREQUENCY OF THE PULSE

FROM a pamphlet on this subject, recently published by Mr. A. H. Garrod, we extract the following summary of the main features of the circulation:—

"The circulation of the blood is maintained by the repeated contraction of the heart. Each cardiac revolution is divided into three parts—the systole, the diaspasis, and the diastole. The following laws hold with regard to the length of these intervals:—

"I. The systole, together with the diaspasis—or, in other words, the first cardiac interval—varies as the square root of the whole revolution.

"II. The systole varies as the square root of the diastole.

"III. The diaspasis is constant.

"The amount of work that the heart has to perform in maintaining the circulation depends on two sets of changes which may occur in the system: 1. Variations in the blood pressure; 2. Variations in the resistance to the outflow of that fluid from the arteries.

"As the capacity of the arteries, including the ventricles, varies directly as the blood pressure, and as the flow of blood from the capillaries does the same, the frequency of the heart's beats is dependent on the resistance to the capillary outflow, and not at all on the blood pressure; in other words, the heart always recommences to beat when the blood pressure in the systematic arteries has fallen a certain invariable proportion.

"Variations in blood pressure result from: 1. Absorption into, and excretion from, the vascular system of fluids; 2. Changes in the capacity of the arterial system, which occur on the contraction or relaxation of the muscular arteries; 3. Changes in the amount of available blood, which result from the hæmastatic dilitation of some of the yielding vessels on altering the position of the body. As changes in the first of these cannot be very sudden, and those in the latter are never very considerable, the mean blood pressure in health varies but little during short intervals.

"Variations in peripheral resistance result from: 1. Different degrees of tonicity or patency of the muscular arteries; 2. Different resistances in the venous system. The former may occur independently in one or other system of vessels, as the cutaneous or the alimentary; also mechanically from pressure on a part of the body. The latter are insignificant in health.

"The heart depends for its power of doing work on chemical properties in the blood it pumps into the systemic vessels, and as the blood reaches it direct from those vessels, the cardiac intramural circulation varies with the changes in the former; and the length of the systole varying only as the square root of the time of diastole, the degree of cardiac nutrition varies directly as the systematic blood pressure, and as the square root of the diastolic time. The coronary arteries supplying the whole heart, the work done by the right ventricle is governed by that done in the left; thus the supply of blood in the left auricle is always rendered sufficient for the requirements of the systemic circulation; though, as there is no reason for believing that the resistance in the pulmonary vessels varies with that of the systemic, there must be some peculiarities in the former circulation (which may explain the variations in the ratio of the number of pulse beats to respirations in some cases).

"The auricular contraction is a very small force, and its function is most probably to close the tricuspid and mitral valve.

"The heart commencing its systole as a whole, it is highly probable that the impulse for action is given by a force which affects both ventricles; such is found in the coronary circulation and the active diastole produced by means of it."

THE CONGRESS OF PREHISTORIC ARCHÆOLOGY

THE meeting of the International Congress of Archæology at Brussels was brought to a close last Friday, August 30. On the previous Tuesday General Faidherbe spoke on the Dolmens, of which he had made a special study in Algeria. He believes them to be the work of some people whose traces can be found from Pomerania to the coast of Africa, and of whose migrations they indicate the halts. Mr. Franks, of the British Museum, presided on the afternoon of the same day, when the discussion turned chiefly on the primitive races of Belgium. On Wednesday the last expedition of the Congress took place, Namur and the Camp of Hastedon, distant about two kilometres from Namur, being the places selected. The establishment of this camp, covering an area of from eleven to twelve hectares, is attributed to the men of the Polished-Stone period. It is situated on a high plateau, and the cuttings made through the ancient enclosure were explained by M. Dupont, Director of the Brussels Museum.

© 1872 Nature Publishing Group

M. Dupont dwelt chiefly on the fact that at the epoch of the Mammoth there were two perfectly distinct populations in Belgium, one using the flint cut at Spiennes, near Mons, and the other that of the Somme. The highly interesting Museum of Archæology belonging to the town of Namur was afterwards examined by the Congress. At the meeting of Thursday, M. Dupont traced the connection of the various populations in Belgium among each other at the different ages of stone; after which a lively debate arose on the question of the descent of the present race of men from the troglodytes, and on the causes of the difference of types. In the afternoon the problems of the Tertiary age and the age of Bronze occupied the Congress. On Friday morning the question of determining the relative remoteness of the ages of bronze and of iron led to many valuable disquisitions; and Mr. Hyde Clarke gave a summary of the recent anthropological discussions at Brighton.

M. de Quatrefages summarised the results of the present Congress, and stated as the principal ones that the elements of the prehistoric populations—even of the age of stone—are discernible in the present population, and that even in the most remote ages the migrations of races took place on a much more extensive scale, and with more frequency than was believed by any one till recently. M. Vervoort, one of the Belgian vice-presidents, next presented to the Congress, in the name of M. Geefs, the well-known sculptor, a bust of M. d'Omalius d'Halloy, who presided in person at this the last meeting of the Congress. This bust is a most striking likeness of the venerable *savant*, who was congratulated by M. de Quatrefages, speaking for the Congress, on the homage rendered to him by his colleagues. M. d'Halloy's services to ethnography have been long and valuable, and his vigour of mind and youngness of heart are astonishing in a man on the verge of ninety.

The proceedings terminated with the distribution to the members of a commemorative bronze medal on the part of the Belgian Government. This medal, having a diameter of nearly seven centimetres, bears on one side, within a laurel wreath, the inscription, "Congrès International d'Anthropologie et d'Archéologie Préhistoriques à Bruxelles. 6^e Session, sous la Présidence de M. T. T. d'Omalius d'Halloy, 1872." The obverse represents the Genius of Science as a female figure, seated, and pointing with her left hand to the entrance of a cavern, bearing the inscription "Furfooz," and a mammoth's skull; while on the other side of the figure the geologist's shovel and pickaxe are displayed. The medal is by M. J. Geerts, of Brussels, and is very finely executed. M. d'Omalius then formally declared the Congress terminated, congratulating the members on the scientific progress achieved, and the harmony which had characterised the meetings.

In accordance with the invitation of the Swedish Government, the next assembly of the Congress will take place at Stockholm in 1874; the proposition to confer the presidency on that occasion on Prince Oscar of Sweden was carried by acclamation. On Saturday the members of the Committee, Belgian and foreign, dined with the King.

THE FRENCH SCIENTIFIC ASSOCIATION

AMONG the subjects expected to be discussed at the general meetings of the French Association at Bordeaux are one on Fermentation, by M. Pasteur, and another on Aërial Navigation, by M. Dupuy de Lôme. In the Mathematical Section, M. d'Abbadie is expected to read a paper entitled "Expériences pour constater les variations de la verticale." In the Physics Section, M. Cornu reads a paper on the "Velocity of Light;" M. Mercadier, one on "Musical Intervals;" M. Poter, on the "Theory of Light." In the Chemical Section, M. Berthelot is to speak on "Questions of Chemical Philosophy," and M. Wurtz on "The Densities of certain Vapours, and particularly on the Density of the Vapour of Perchloride of Phosphorus." In the Meteorological Section, M. Marié Davy is expected to read a paper on "The Organisation of Meteorological Observatories."

Other expected papers are—In Geology, M. Daubrée, "Beds of Phosphates in the South of France;" M. des Cloiseaux, "Amblygonite and Martebrasite." In Botany, M. Baillon, on "*Rheum* and on the Botanic Origin of Officinal Rhubarb;" M. Chatin, "Study of the Development of the Ovule and the Grain in the Scrophularias." In Zoology, MM. de Follin, Fischer, and Périer, contribute a paper on "Recent Submarine Explorations; M. Chatin, "Researches on the Odorous Glands of certain Mammifers;" Dr. Pouchet, on "Animal Pigments;" M. de Quatrefages, on "Some Species of Inferior Animals of the Basin of Arcachon." Anthropology, M. Broca, on "The Occipital Angles." Geography, M. Gustave Lambert, on "An Expedition to the North Pole."

The Excursions are:—1. To the embouchure of the Gironde, to inspect the encroachment on the coast. 2. To Arcachon, to visit the oyster-beds, dredge the sea for molluscs, &c. 3. To Les Eyzies, to inspect pre-historic remains and bone-caves. 4. To Roueyre, to inspect the iron of the Landes, &c. 5. To Bidassoa, on the Spanish frontier, to inspect a rich bed of iron ore. 6. To Medoc, on a visit to the celebrated vineyards of Château-Margaux and Château-Montrose. Besides these excursions, visits will be made in Bordeaux itself, to M. Gintrao's establishment for rearing silkworms in the open air; to the docks, dockyards, &c., and the artesian wells of Vigan In our last number we gave a list of the public lectures.

TEMPERATURE OF THE SEA BETWEEN GREENLAND, NORTHERN EUROPE, AND SPITZBERGEN

PROF. H. MOHN, Director of the Norwegian Meteorological Institute at Christiania, publishes in *Petermann's Mittheilungen* some important facts regarding the variations of temperature in the North Atlantic. The yearly variation of temperature of the surface stratum amounts to 9° Fah. and more; it becomes less as we go down, the decline, however, being not everywhere the same. Deep-sea strata reach their lowest and highest temperatures a little later than the surface stratum, the changes offering two very distinct aspects for summer and winter. Deep-sea observations in several of the deep fjords along the Norwegian coast, which are protected against the great depth of the Atlantic by submarine ridges lying before them, show that the water in them is derived from the Gulf Stream, and that they are filled with it from top to bottom, even if the latter lies deeper than the icy bed of the Gulf Stream outside the coast region; were this not so, the temperature of the water in the fjords would be a much lower one, and Norway would not enjoy such a happy union of land and sea climate. In summer, near the coast of Norway, and in its fjords, at a depth of from 100 to 300 fathoms, we find a uniform temperature of about 44° Fah.; farther out to sea, however, at the same depth, only about 39° Fah. The deep-sea temperatures in winter are less known, but it is almost certain that at great depths the same temperature reigns all the year round, although a continual cooling from the surface downwards necessarily takes place in winter. In the north-western part of the Greenland Sea, and below the depth of the Gulf Stream, exclusively icy water is found, which somewhat compresses the latter on that side, at any rate on the surface, where the water cooled during the winter nights remains over the warmer waters beneath. Along the coast of Norway the cold from the land acts on the surface and the upper strata of the sea, increasing

© 1872 Nature Publishing Group